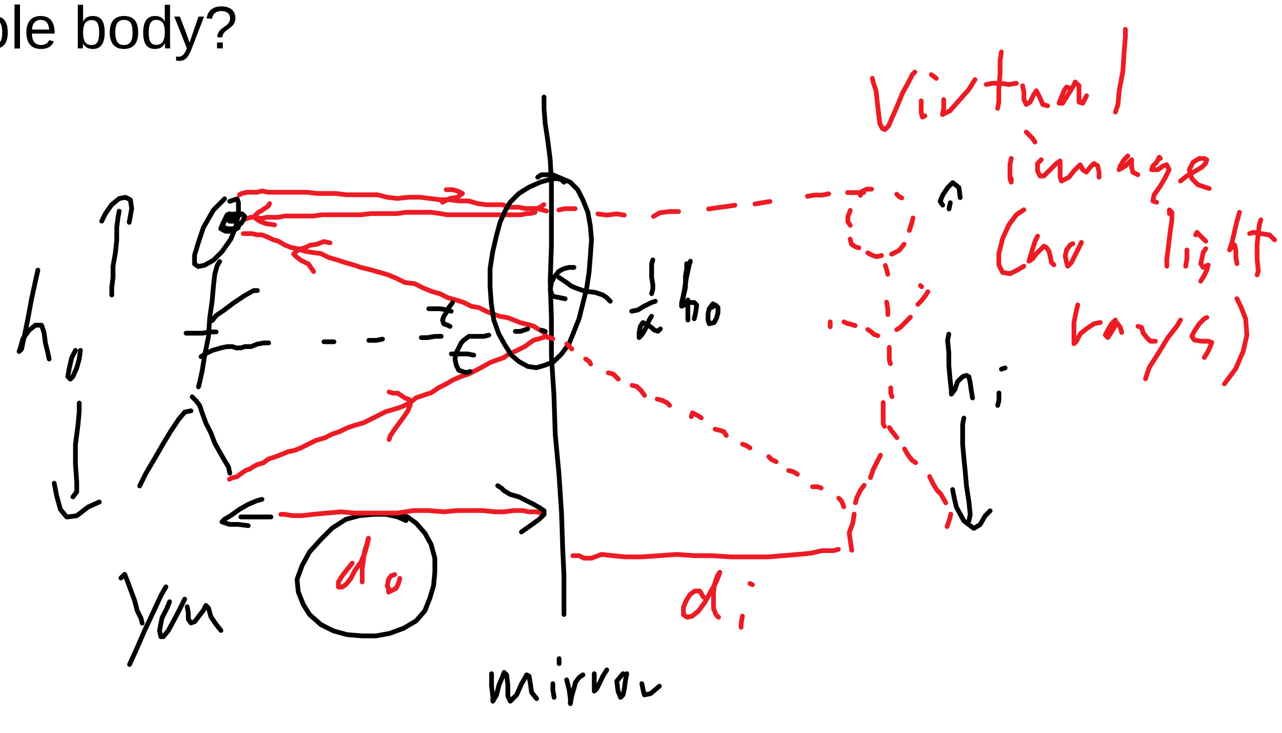
Playland - don't forget Thursday May 5th
Assignment is due Friday, May 13th.

Geometric Optics (chapters 18, 19)

Curved Mirrors

Plane mirror - flat mirror.

What is the smallest mirror that will show your whole body?



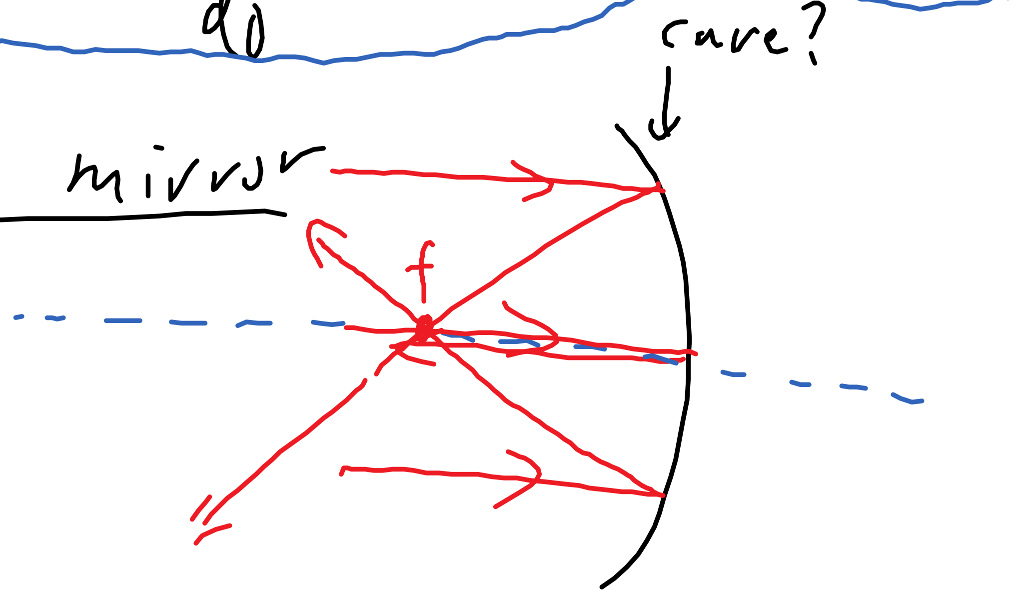
$$m = \frac{h_i}{h_o} = 1 \qquad h_i = h_o$$

$$m = \frac{-d_i}{d_o} \qquad \text{so } d_i = -d_o$$

$m = -\frac{d_i}{d_o}$ so $d_i = \ldots d_o$

Concave mirror

Principle Axis



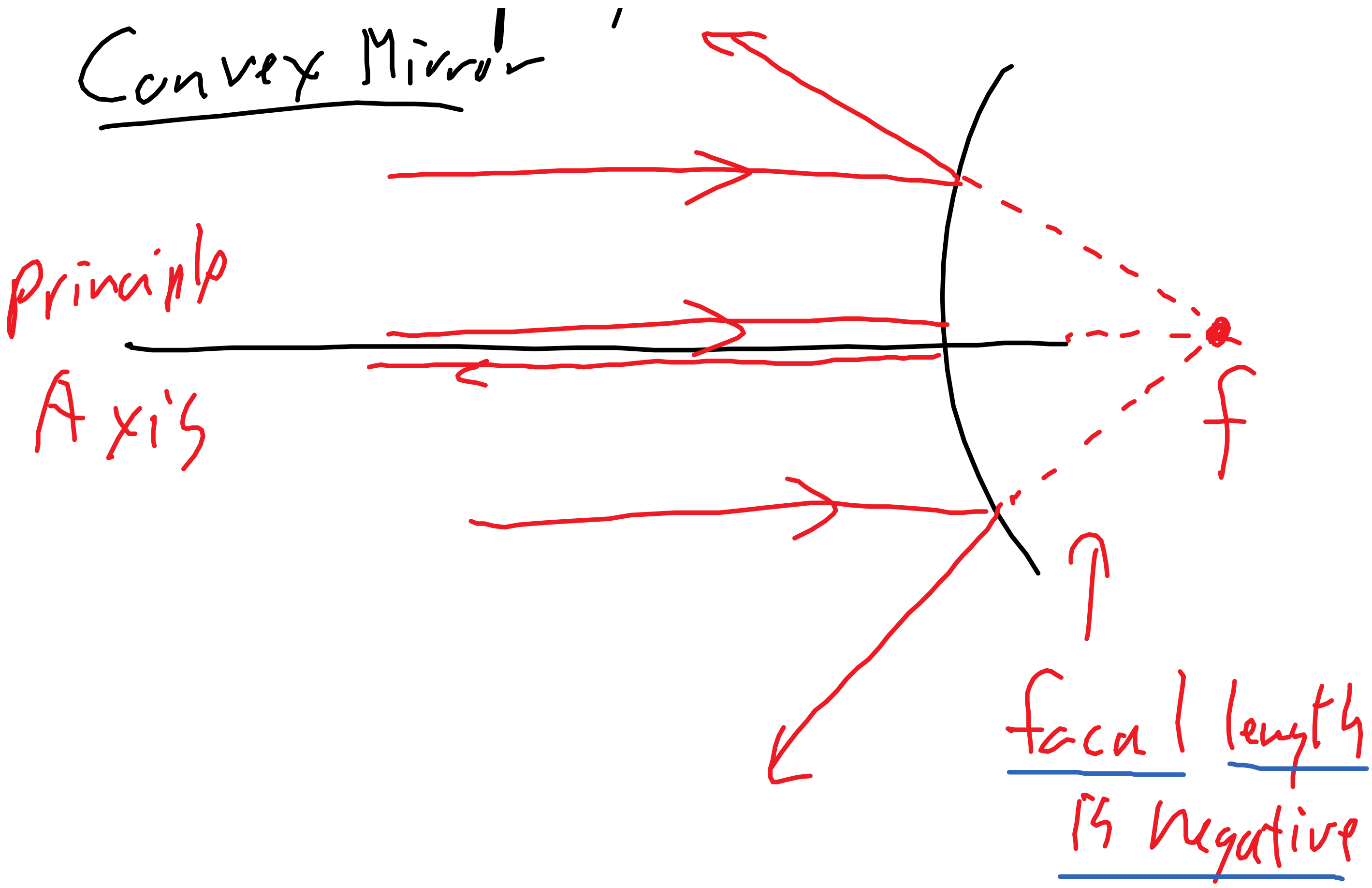
f is the focal Point

* rays parallel to the principle axis reflect to/from the focal point

- Objects $d_o > f$, the image is flipped

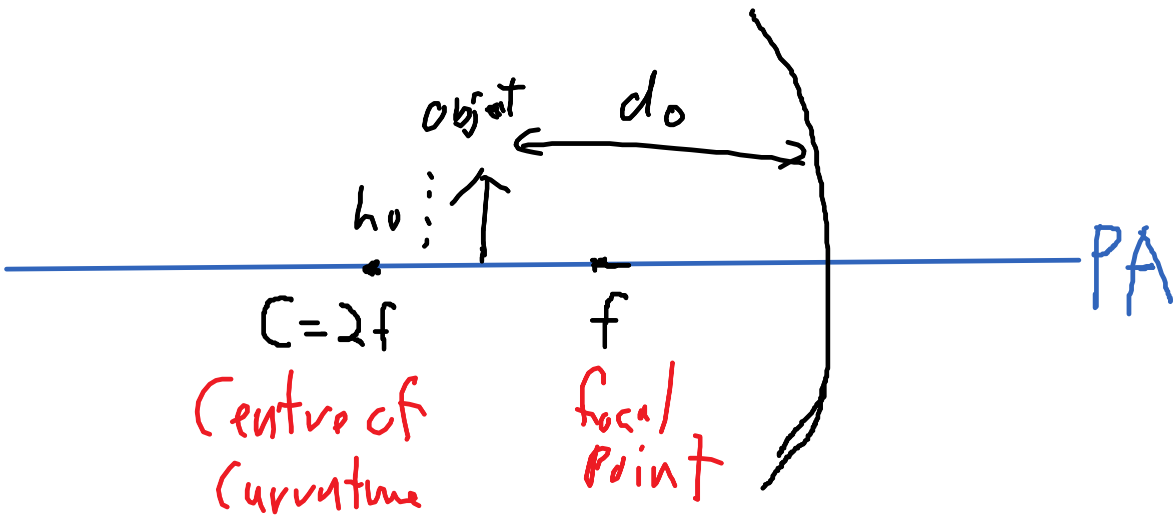
$d_o < f$ image is upright + larger

Convex Mirror

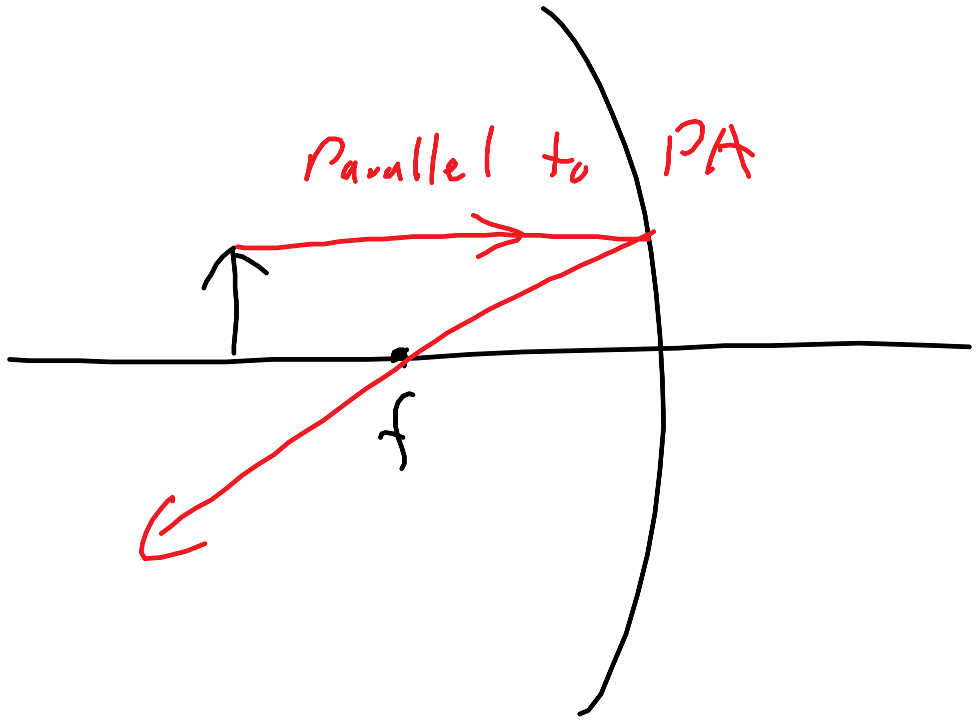


Rules for Ray diagrams:

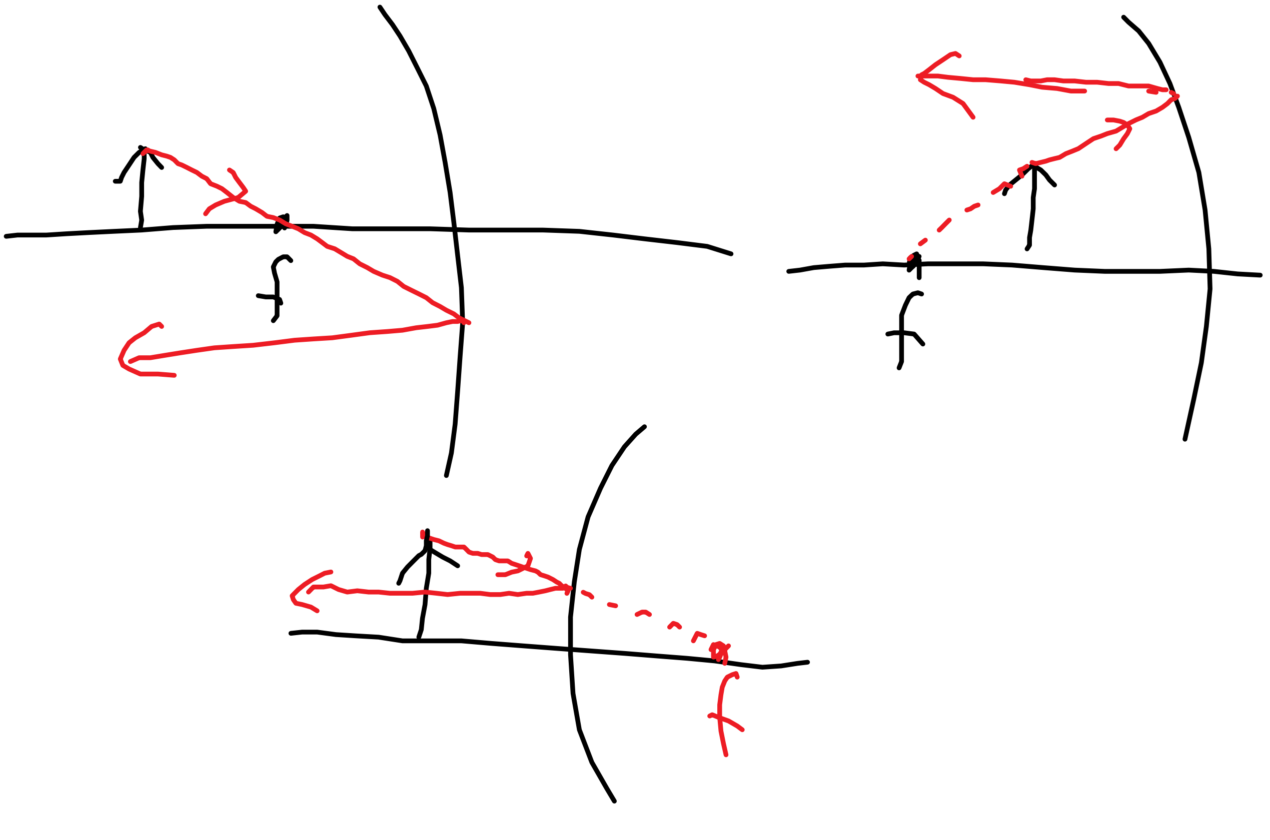
1. Draw a principle axis (horizontal line)
2. Draw a mirror or lens centred on the principle axis.
3. Draw an arrow from the principle axis to a height, ho to represent the object.



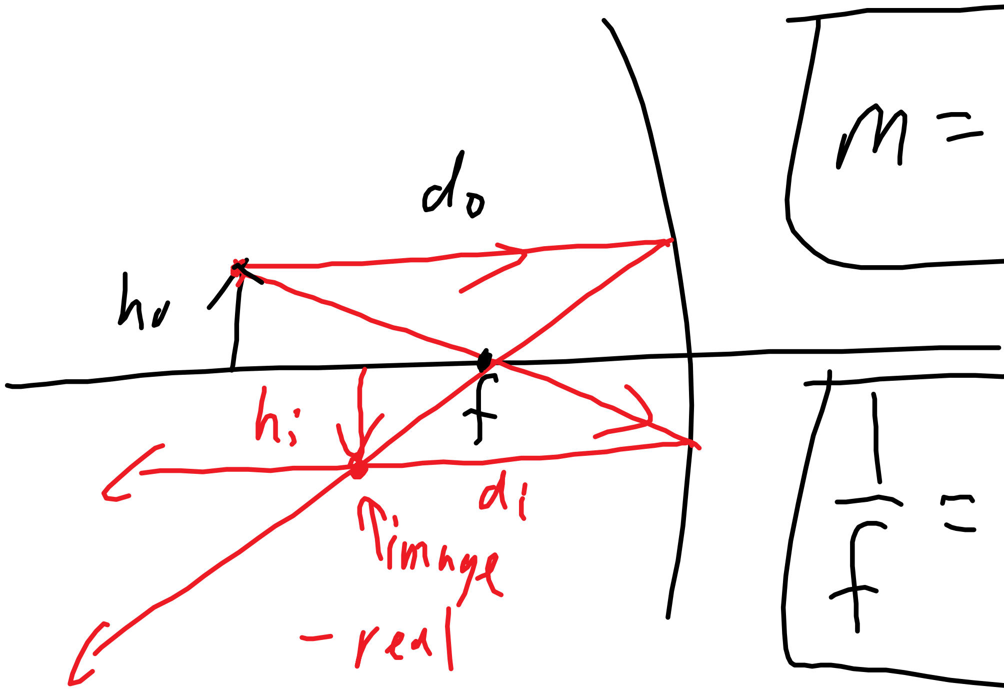
4. Draw a light ray from the top of the arrow parallel to the principle axis to the mirror. It reflects to/from the focal point.



5 Draw a ray to/from the focal point. It will reflect parallel to the principle axis.



6. Where the light rays meet, or seem to meet, draw an arrow to show the height and location of the image.



$$m = \frac{h_i}{h_o} = -\frac{d_i}{d_o}$$

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

Eg. A concave mirror with focal length 35 cm (f) is 1.00 m (do) away from a 8.0 cm (ho) filament.

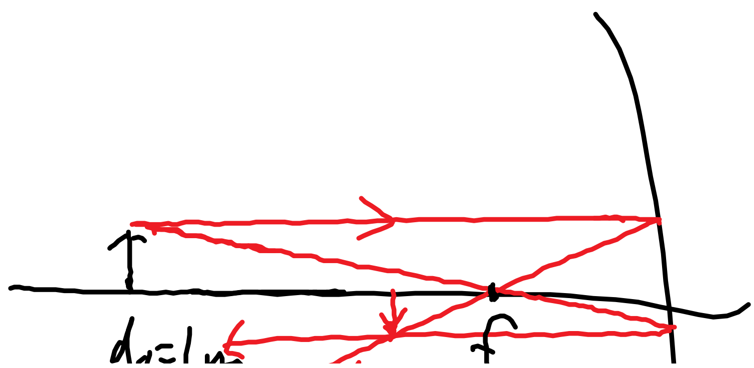
a) What is the centre of curvature of the mirror?

c=2f = 2x35=70 cm

b) Where should I put a piece of paper to observe the image of the filament?

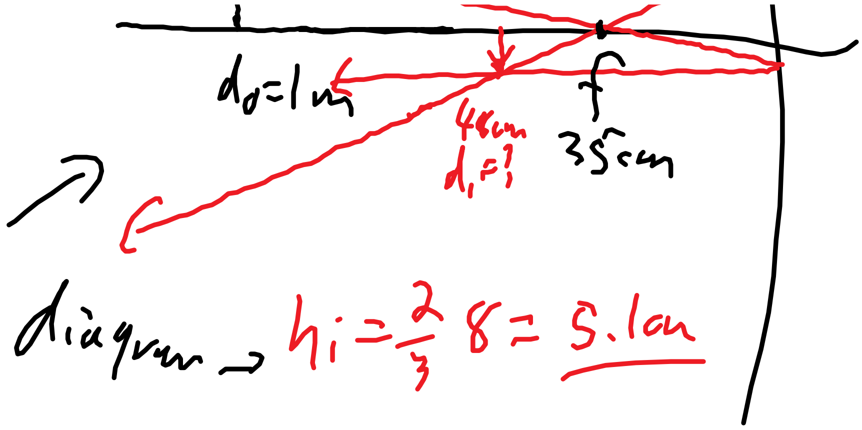
Ray diagram:

Scale 1:2



$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$\frac{1}{35} = \frac{1}{100} + \frac{1}{d_i}$$



Scale diagram → $h_i = \frac{2}{3} 8 = 5.1cm$

$\frac{1}{35} = \frac{1}{100} + \frac{1}{d_i}$

$d_i = 54 cm$

$h_i = h_o \cdot \frac{-d_i}{d_o} =$

$h_i = 8cm \left(\frac{-54}{100} \right)$

$= 4.3cm$

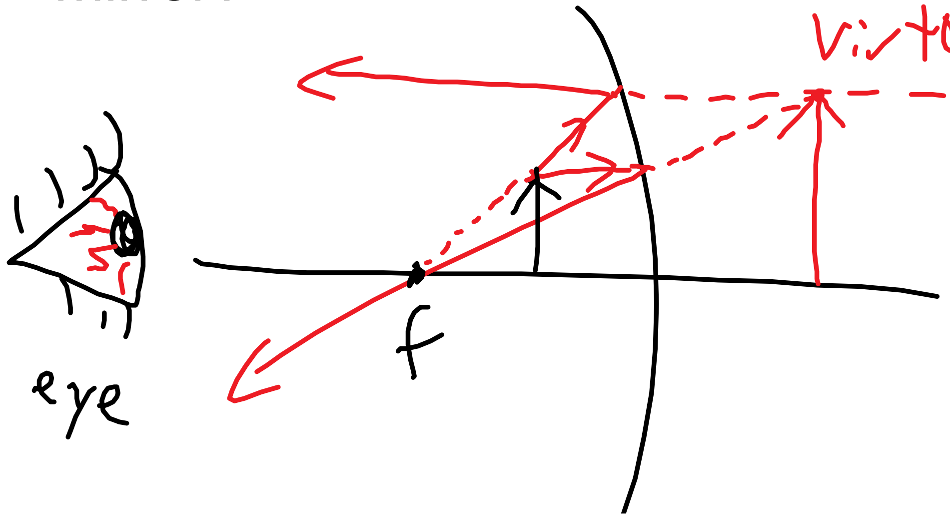
a) What is the size of the image? Is it real?
The image is real because it is formed by light rays.

Solve using i) ray diagram ii) equations

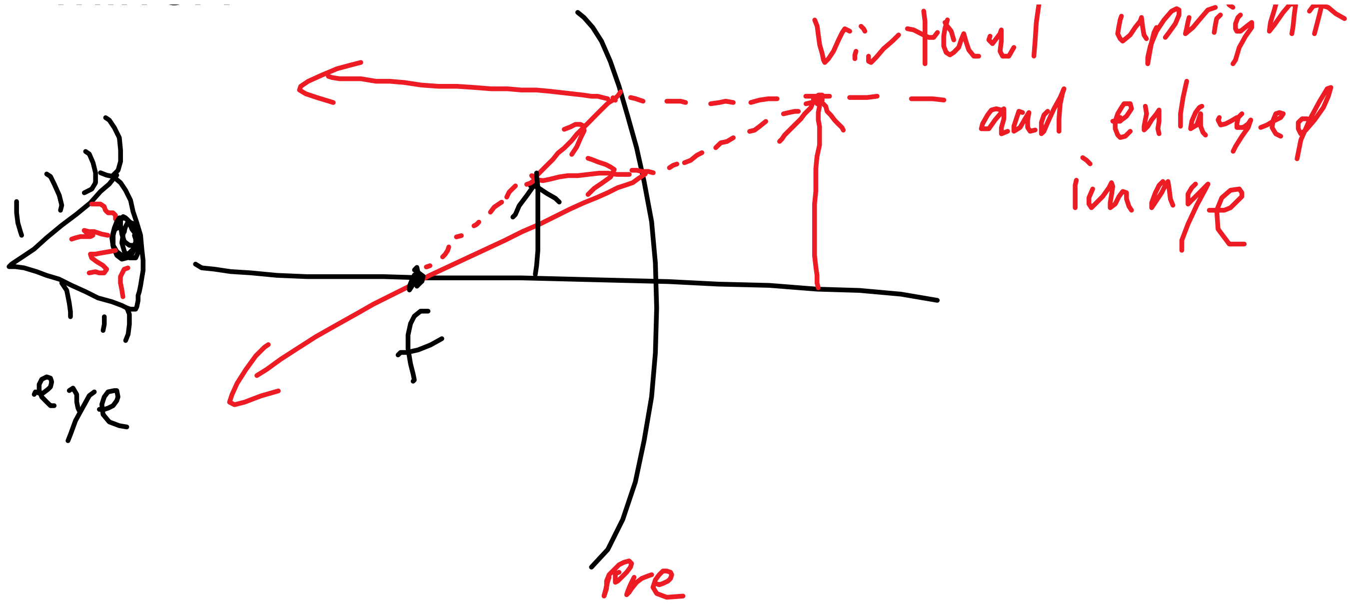
Ch 18 q1-4 p374 Q1 - ray diagram (answer at back is off)

Q5-8, 9-12

What if we moved the light to be 6 cm from the mirror?

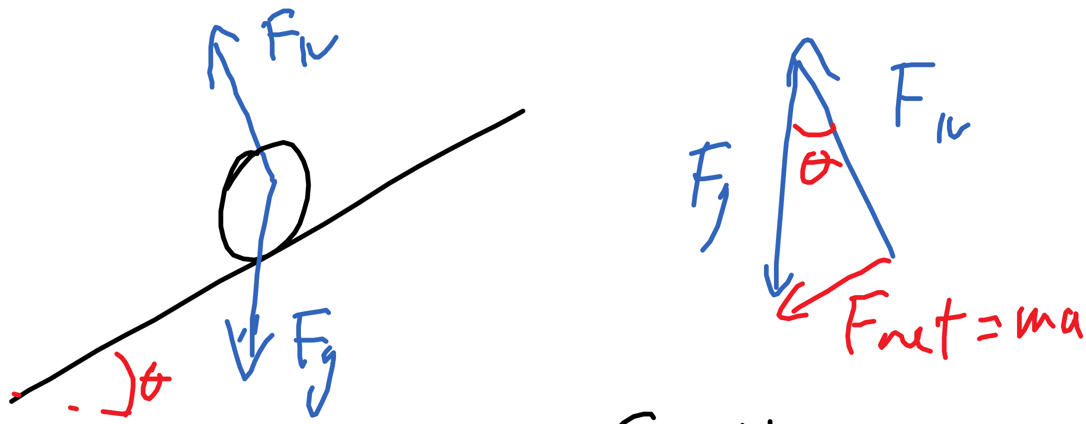


virtual upright and enlarged image



General Dynamics ~~review~~ preview:

a)

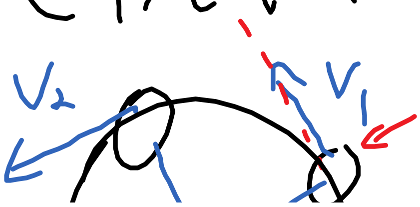


SOH

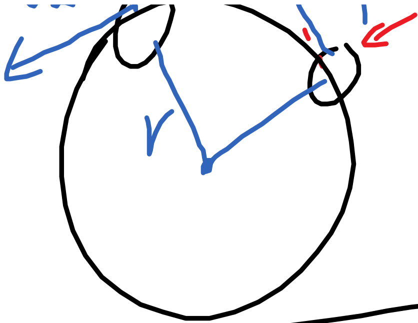
$$\sin\theta = \frac{ma}{mg}$$

b) $E_g = E_k$

c) Circular motion



Velocity changes

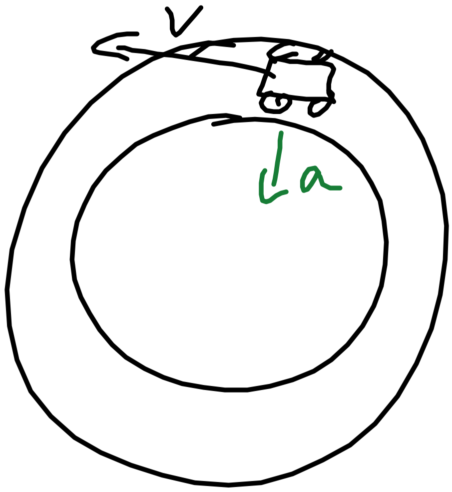


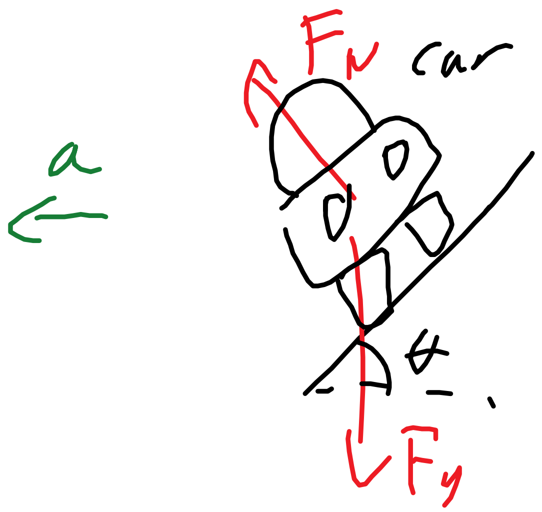
Velocity changes even if speed is constant.

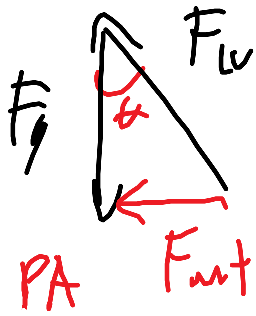
$$a = \frac{v^2}{r}$$

Centripedal acceleration towards the centre of the circle.

e) banking



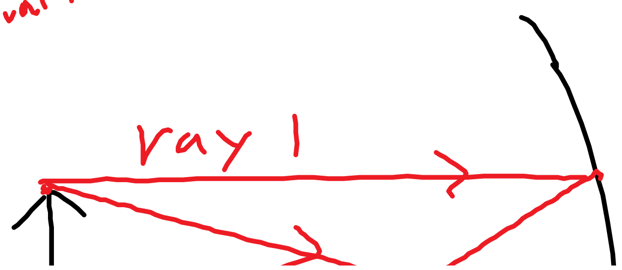


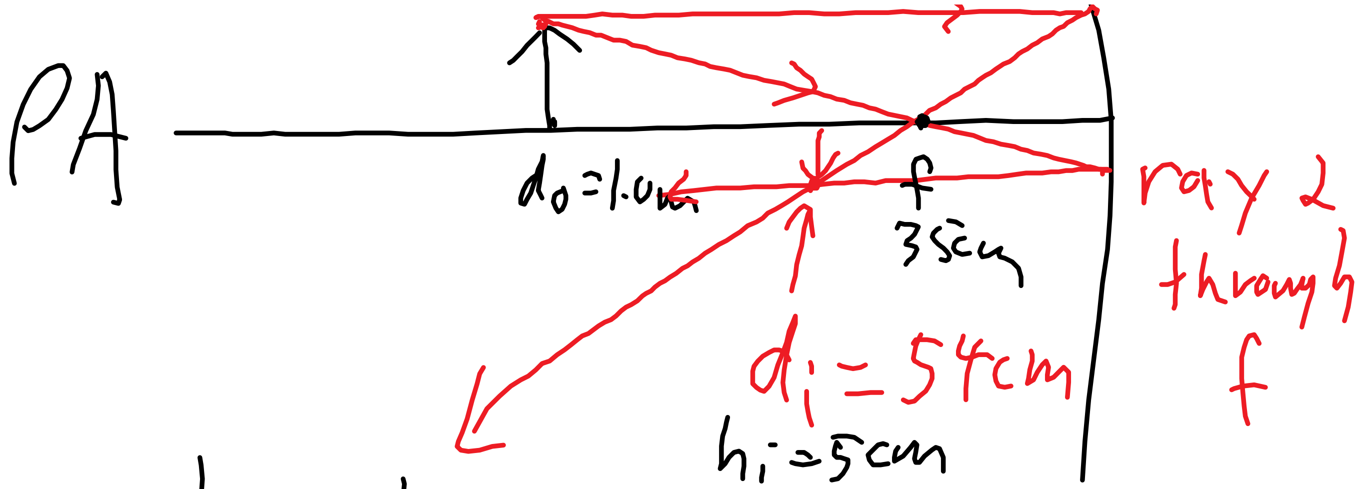


$$\tan\theta = \frac{ma}{mg}$$

Scale 2:1

ray 1 parallel to PA





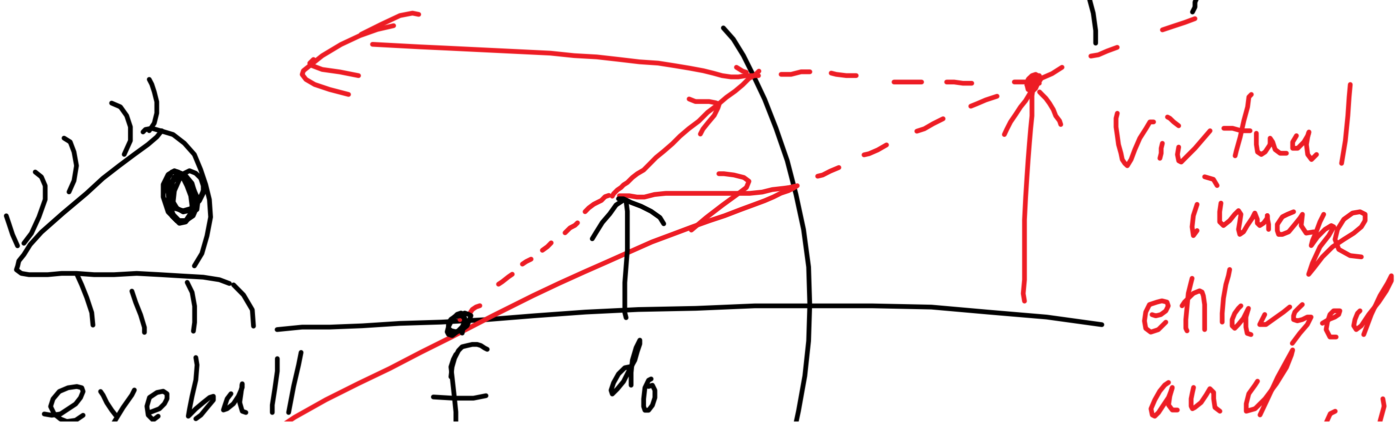
$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i} \qquad \frac{1}{35cm} = \frac{1}{100cm} + \frac{1}{d_i}$$

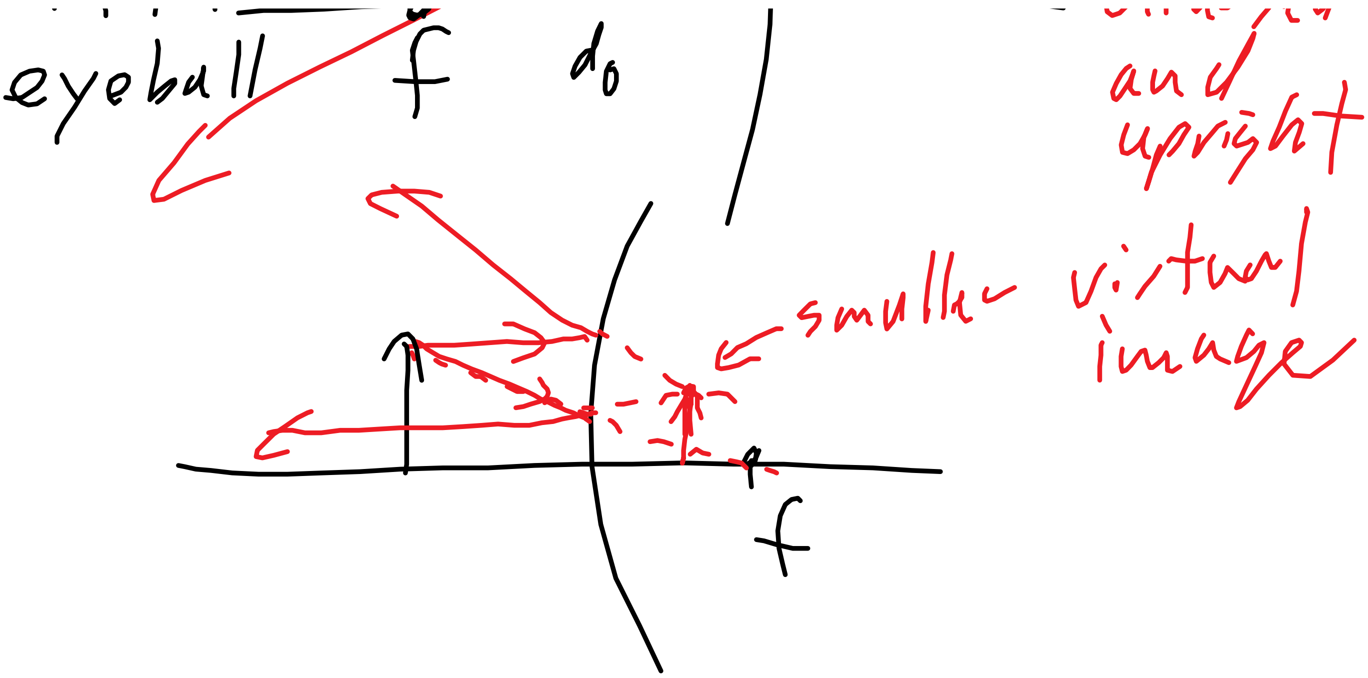
$$\boxed{d_i = 54cm}$$

$$h_i = h_o\left(\frac{-d_i}{d_o}\right) = 8cm\left(\frac{-54cm}{100cm}\right)$$

$$\boxed{h_i = -4.3cm}$$

what if $d_o < f$?

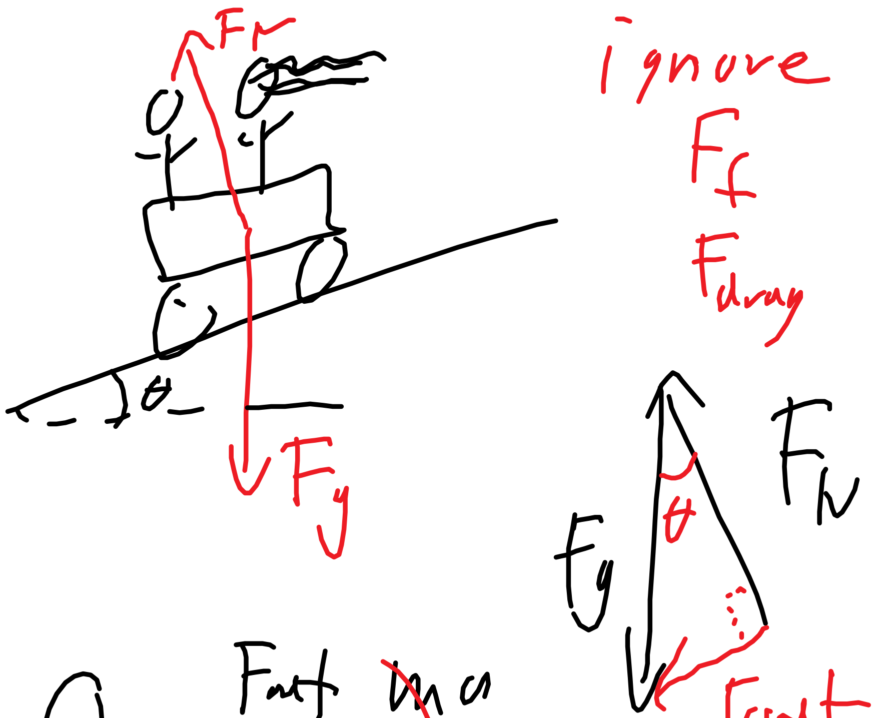




General Dynamics review:

Pre-

a)



ignore F_f, F_{drag}

$$\sin\theta = \frac{F_{net}}{F_g} = \frac{ma}{mg}$$

$$\boxed{\sin\theta = \frac{a}{g}}$$

no friction

b) conservation of energy

$$E_g = E_k$$

c) +d) Circular Motion

if speed is constant but direction changes, Velocity changes

$$a = \frac{v^2}{r}$$

Centripedal acceleration towards the centre of the circle, radius r